CAREERS

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A palaeontologist pieces together the bones of a dinosaur at the Musée des Confluences, a science centre and anthropology museum in Lyon, France.

MUSEUMS

Collate, curate and animate

Curatorial work provides an ideal opportunity to combine research with public engagement.

BY AMBER DANCE

Matt Rayner was planning for an academic career in ornithology and conservation biology when a colleague pointed out an advertisement for a curator of land vertebrates at the Auckland War Memorial Museum in New Zealand.

The ad described the role as maintaining a research programme, managing and developing the museum's collection, and working with the gallery and exhibition staff to interpret scientific content for museum visitors.

Rayner, then a postdoc at the University of Auckland, enjoyed both science and public engagement — in which he already had some experience through working with the media and Maori communities. Intrigued by the idea of combining those two interests within his career, he applied and was given the job. Three and a half years on, Rayner loves his role working with the museum's collections and with its visitors.

His days mix studies of the ecology and taxonomy of local birds — this year, he published a paper on the migration of petrels to Antarctica[1] — collaborating with designers and other museum staff on exhibitions, and interacting with children and families. "People are always super-appreciative" of the time he spends with them, he says.

Museum jobs offer the chance to pull fresh insights from collections. They also provide an opportunity to work with a diverse group of people — including not just researchers in other specialities, but exhibition designers and communications specialists.

Museum-based scientists used to focus solely on studies and their collections. "The modern museum is not like that," says geologist Lori Bettison-Varga, president and director of the Natural History Museum of Los Angeles County in California. "We're all about having our research scientists and curators and collection managers engaging with the public."

Scientists working in modern museums have a range of public-engagement tools at their disposal, including social media, the printed or spoken word, and citizen-science projects. "Museums, in general," says Rayner, "suit people who get on with people."

But there are some downsides. Salaries at museums tend to be lower than those for similar roles in other sectors, and some museums are struggling to maintain staff and space in the face of budget cuts. Curators at any kind of museum in the United States and its territory of Puerto Rico earn an average of US$47,000–60,000, depending on seniority, according ▶

to the American Alliance of Museums, although it notes that science-focused centres were under-represented in its sample. The UK Museums Association assessed salaries for diverse museums in 2016 and noted that, overall, museum salaries lag behind those for comparable jobs in other markets by about 7%. Still, few researchers earn huge salaries, notes Rebecca Johnson, director of the Australian Museum Research Institute in Sydney. "Museum salaries might be a tiny bit lower than other science salaries, but not significantly so," she says. In any case, she adds, museum jobs offer high prestige.

Museums themselves face an uncertain future. In the United Kingdom, 64 museums have closed since 2010, mostly because of a dearth of public funding, according to the Museums Association. Although most British museums reported that staff numbers were holding steady, many publicly funded museums reported staff cuts. At natural-history museums, specifically, staff numbers are dropping[2]. Some museums have also lost storage or display space for their collections.

An independent report on UK museums in November found that public funding for museums had dropped 13% in the past decade (see go.nature.com/2jvtaxx), and that new funding is unlikely to pour in soon.

In the United States, under then-President Barack Obama, the US National Science Foundation in 2016 suspended a programme for maintaining biological collections. President Donald Trump has since proposed eliminating the Institute of Museum and Library Services, which provides grants.

PhD-level museum jobs open up only rarely, and they attract fewer applicants than do faculty positions, says Bettison-Varga. Among her museum staff of 400, there are 15 curatorial positions and just one opening, in ornithology. Such positions are typically advertised in publications such as *Science* and *Nature* as well as through associations that match a discipline with an opening, she says.

Bettison-Varga herself hadn't considered museum work until she was recruited. Previously, she served as president of Scripps College in Claremont, California. She found her work in liberal-arts education a good springboard for a career in museums, because she was already used to a mix of research and education, and had worked with colleagues in other disciplines.

The factor uniting science jobs in museums is the collections, but these can relate to a wide range of disciplines. Climate scientists, imaging specialists, chemists and crystallographers — all these might find a place in today's museums.

For example, Johnson, who started at her institute as a laboratory manager in 2003, is a wildlife geneticist. As she worked her way up the ladder, Johnson helped colleagues working with diverse specimens to add a genetic element, such as DNA barcodes, to the morphological and ecological information, such as skull shape and collection location, that they use to identify specimens.

JOSIE BUERGER

Anne Jungblut, a microbiologist at London's Natural History Museum, collects biofilm samples.

She and her colleagues also use DNA to help airports to identify birds hit by planes, so that they can develop the appropriate strategies to prevent future strikes. They also run a forensic lab to identify species affected by the illegal wildlife trade. On the rare occasions when DNA testing fails to return an answer, the researchers can turn to the collections to find animals with feathers or microscopic features comparable to those of the tissue they're trying to identify.

ACADEMIC ADVENTURES

Like many museum scientists, Anne Jungblut, a microbiologist at the Natural History Museum in London, attributes her position in part to luck. She met researchers from the Natural History Museum during her postdoc at Laval University in Quebec City, Canada, which gave her a sense of the variety of research going on there. And when the museum called for junior researchers, she applied, even though she thought that her CV would never measure up.

Now she spends her time much like a university academic, she says — doing lab work, such as DNA analyses of samples from the museum's collection; writing grants and papers; and supervising students (who must have a co- or primary adviser at their own university, because the museum does not confer degrees). The main difference compared with typical academic life, she says, is that she does little formal teaching.

Being able to access and study museum specimens has directly contributed to her research. Earlier this year, for example, Jungblut analysed the cyanobacterial maps collected by Captain Robert Scott's expedition to Antarctica more than a century ago. New DNA techniques allowed her to determine that despite climate change, today's cyanobacteria are quite similar[3] to those of Scott's time.

Today's museum scientists must preserve today's specimens, too, for some future, unimagined technology. "We think about what we have, and we think about what five generations of scientists after us are going to do with it," says Johnson.

Museum researchers are also pondering who those scientists might be, and whether a future colleague might be eyeing their exhibits. "There are many scientists and graduate students whom I met a long time ago at the museum, when they were primary and middle-school students," notes Makoto Manabe, director of the Collection Center and Center for Molecular Biodiversity Research at the National Museum of Nature and Science in Tokyo.

A MULTIFACETED ROLE

Palaeontologist Nick Pyenson secured a job as curator of fossil marine mammals at the Smithsonian Institution in Washington DC, one year into his postdoc on the biomechanics of feeding in modern whales. His role has several facets. As a researcher, he studies the evolution of marine mammals. And as a curator, he manages tens of thousands of fossils and other specimens. Ensuring that this legacy is preserved — by repairing damaged specimens, for example, or preserving ancient field notes — is a "big responsibility", Pyenson says.

In addition to working with and tending to collections, there's the public-communication aspect of the job. "There's definitely an expectation that you do that," Pyenson says. His outreach efforts include writing a book about his globe-trotting research adventures.

And when he published findings about the evolution of body size in whales[4], he went to his public-affairs office to develop a media package, including whale-bone video

that he shot himself in the Smithsonian's off-site storage facility.

The public-facing aspects of museum jobs are often a draw for applicants. "You can do research and teaching at universities, but at the museums, you can also share what you think is exciting with the general public, through exhibitions," says Manabe. Studies suggest that many people learn about science topics such as climate change not so much in the classroom, but in informal environments such as museums and zoos[5,6].

Museum scientists also work with non-scientists more often than do many other types of researcher. For example, designing exhibitions might involve working with artists and educators. "You have to be a team player, and recognize the expertise that other people have," says Bettison-Varga.

Museum visitors love the chance to speak directly with scientists, says Molly Porter, school-programmes manager at the Natural History Museum of Los Angeles County. For example, she organizes workshops for teachers. The goal, she tells the scientists who take part, is to make their work accessible and relevant.

COLLECTIVE EXPERIENCE

Scientists chasing museum jobs must have CVs that demonstrate relevant experience. For top-level curator and researcher positions, high-quality science and a PhD are crucial. Experience with collections is also important. One path towards such experience is to select a graduate programme with a museum affiliation, suggests Bettison-Varga. A university might have links with a museum, or it might have its own collections.

Museums also look for people who've worked in informal learning environments, says Perry Roth-Johnson, an exhibit researcher in air and space at the California Science Center in Los Angeles. Researchers can pick up required skills by volunteering or interning at a museum. Scientists can offer to write materials, give a lecture or run a hands-on workshop with the museum. Researchers might also sign on to mentor students through the museum's networks.

Persistence can pay off, too. Palaeontologist Ghazala Roohi first applied to the Pakistan Museum of Natural History in Islamabad in 1984, after earning her master's degree. She wasn't hired, so six months later she obtained a volunteer research-associate position. Two years later — after joining a joint expedition with the Pakistan museum and a visiting team from Harvard University's Peabody Museum of Archaeology and Ethnology in Cambridge, Massachusetts — she won a permanent salaried job at the museum. She earned a PhD in 2013 and now directs the Earth-sciences division.

Scientists need not find a full-time museum position to work with collections. Researchers can often visit to do so, as Roohi did while she worked on her PhD. She spent time at seven museums to study fossils of rhinoceros and of Baluchitherium, the largest land mammal ever to walk Earth[7,8].

Another way to access collections is to become an associate researcher. Chemical biologist Mandë Holford earns her salary at Hunter College in New York City, but she is also affiliated with the nearby American Museum of Natural History, and so can access lab space and the museum's collections.

The museum doesn't tend to advertise associate positions, she says. But she got in touch and, on the basis of her CV and publication record, the curators voted that her work would contribute to the museum's interests. "It's a way for the museum to expand its scientific reach and its staff," says Holford. Today, with a foot in research both at a university and in a museum, she can help students from either place to find opportunities and internships. She has also given presentations and mentored students who came to her lab as a result of her museum connections. "You get to reach out to the public in ways that you can't do as a traditional university faculty," says Holford. Because no one else there studies molluscs, she works with a collection manager to maintain the mollusc cabinets.

"We think about what we have, and we think about what five generations of scientists after us are going to do with it."

Scientists who work in museums report high levels of satisfaction. "If it's right for you, then it's deeply fulfilling," says Johnson — who feels that way about her job even when she's elbow-deep in koala guts, gathering their organs to determine which genes are expressed where.

Many of her former colleagues, she notes, stick around after they retire, enjoying their research while freed from the burden of administrative tasks. "They literally retire and come back to work the following Monday," she says. "How lucky that we get to work in something that doesn't even feel like a job." ■

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1. Rayner, M. J., Taylor, G. A., Gaskin, C. P. & Dunphy, B. J. *Emu* **117,** 290–298 (2017).
2. Kemp, C. *Nature* **518,** 292–294 (2015).
3. Jungblut, A. D. & Hawes, I. *Proc. R. Soc. B* **284,** 20170833 (2017).
4. Slater, G. J., Goldbogen, J. A. & Pyenson, N. D. *Proc. R. Soc. B* **284,** 20170546.
5. Falk, J. H. & Dierking, L. D. *Am. Sci.* **98,** 486–493 (2010).
6. Clayton, S. in *Oxford Research Encyclopedia of Climate Science* (ed. von Storch, H.) (Oxford Univ. Press, 2017).
7. Roohi, G., Raza, S. M., Khan, A. M., Ahmad, R. R. & Akhtar, M. *Pak. J. Zool.* **47,** 1433–1443 (2015).
8. Antoine, P.-O. *et al. Zool. J. Linn. Soc.* **160,** 139–194 (2010).

IMMIGRATION

EU workers eye the exit

Brexit, the withdrawal of the United Kingdom from the European Union, continues to foster anxiety among European nationals who work in Britain as scientists and in related occupations, a study finds.

A membership survey by Prospect, a London-based trade union whose members include 141,000 scientists and engineers, found that nearly 70% of the 650 respondents who are European nationals are considering leaving the United Kingdom. About half of those respondents work in science, technology, engineering and mathematics.

The numbers echo findings from a January survey of 1,000 UK-based university faculty and staff members. That study, conducted by the University and College Union, which represents UK higher-institution employees, found that 76% of respondents who were EU nationals were considering leaving the United Kingdom in the wake of Brexit.

The Prospect study reveals ongoing concerns about the free movement of highly skilled workers and uncertainty about how the government will address migration issues.

RESEARCH

US federal funding rises

US federal funding of academic research and development (R&D) increased between 2015 and 2016 for the first time since 2010, according to data from the US National Science Foundation (NSF).

When adjusted for inflation, federal funding for academic R&D rose by 1.4% during that period, former President Barack Obama's last year in office, the data show. The NSF examined 640 US institutions that reported at least US$1 million in R&D outlays during their previous fiscal year.

Universities reported increases in research funding from all major federal agencies except the NSF. Research funded by NASA and the Departments of Agriculture, Defense, Energy and Health and Human Services — of which the US National Institutes of Health is part — rose between about 2% and 8% over 2015.

Research funded by nonprofit organizations soared by 9.4% to $4.6 billion. Nonfederal funding from other national or federal governments, other universities or from donations also surged, rising nearly 9% to $2.2 billion in 2016.